used in the actual execution of the work shall strictly conform to the quality of samples approved. In case of variation in quality such materials shall be liable for rejection. The rejected materials shall be removed from the site within 48 hours of their rejection, also the Engineer-in-Charge shall be authorised to remove the same at the risk and cost of the Contractor.

3.3 Quality control and Testing of Materials

i. The Contractor at his own expense shall make arrangements with necessary equipment to carryout tests such as grading of aggregate, fineness modulus of sand, bulking of sand, silt content in sand, tests on cement and concrete etc., at the site of work. The Contractor shall be required to provide appliances at site such as weighing scale, graduated cylinder, standard sieves, three wooden / metal board of size 0.5 x 0.5 mtr = 0.25 sqm area, one digital contact thermometer, two screw drivers, one measuring scale, camber board, depth gauge, three meter long wooden or aluminum beam or straight edge, one graduated scale bit or wedge scale, etc., in order to enable the Engineer-In-Charge to conduct field tests, whenever required by him to ensure that the quality is consistent with the prescribed specification. Similarly well-equipped laboratory for testing of concrete, aggregates including earth work shall be provided by the Contractor at site of work.

ii. Materials including but not limited to water, sand, cement and aggregate to be used in the works such as concrete, masonry, road work, shall pass all the tests and analysis required.

iii. All the necessary tests shall be conducted in the laboratory established at site by the Contractor or in any recognized laboratory approved by the Engineer-in-Charge. The samples shall be taken for carrying out all or any of the tests stipulated in the particular specifications or as directed by the Engineer-In-Charge or his authorized Representative. The Contractor shall at his risk and cost make all arrangements and shall provide all such facilities as the Engineer-in-Charge may require for collecting, preparing, forwarding the required number of samples for test and for analysis as per the frequency of test stipulated in the Contract specifications or as considered necessary by the Engineer-in-Charge.

iv. The decision of the Engineer-in-Charge regarding type of tests, their frequency, suitability of any of the materials to be used in the work shall be final and binding on the Contract or notwithstanding any other provision elsewhere in the tender Documents.

v. The Contractor or his authorised Representative shall co-operate in collection, preparation, forwarding and testing of such samples. Even if he, or his authorised Representative is not present, the result of such tests and consequences thereon shall be binding on the Contractor provided the Contractor has been provided with prior intimation of such tests. The Contractor or his authorised Representative shall remain in contact with the Engineer-in-Charge or his authorised Representative for the conduct of all such operations.

vi. The Contractor shall give not less than 3 days' notice of all tests in order that the Engineer-in-Charge or his authorised Representative may be present. The Contractor shall supply two copies of all test certificates to the Engineer -in - Charge for approval, immediately after the completion of the tests. Test certificates shall invariably be supplied to the Engineer - in Charge before the material or components are used in the works, unless the Engineer-in-Charge directs otherwise.

vii. All materials, which are specified to be tested, at the place of manufacture, shall satisfactorily pass the test before being used in works.

viii. Other Materials

Any material, for which there is no relevant Indian Standard, shall be the best of their kind and to the approval of the Engineer-in-Charge. Contractor shall at his own expense, submit to the Engineer-in-Charge for approval, samples of any of the materials and components to be used. The quality of materials and components subsequently used in the works shall not

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be inferior to the approved samples.

3.4 Construction Equipment

i. The methodology and equipment to be used on the project shall be furnished by the Contractor to the Engineer-in-Charge well in advance of commencement of work and approval obtained prior to its adoption and use.

ii. The Contractor shall give a trial run of the equipment for establishing the capability to achieve the laid down specification and tolerance to the satisfaction of the Engineer-in-Charge before commencement of work.

iii. All equipment provided shall be of proven efficiency and shall be operated and maintained at all times in a good working condition.

iv. No equipment or personnel shall be removed from the site without prior permission of the Engineer-in-Charge.

v. No tools and plants will be supplied by the department and the Contractor will have to make his own arrangements at his expense.

All construction tools, plant and machineries provided by the Contractor shall, when brought to the site, be deemed to be exclusively intended for the construction and completion of this work and the Contractor shall not remove the same or any part thereof (save for the purpose of moving it from one part of the site to another) without the written permission of the Engineer-in-Charge.

Other specifications listed shall be referred to as necessary:-

1. Karnataka Building specification
2. Karnataka Standard rate analysis for building.
3. Karnataka roads and bridges specifications.
4. Karnataka standard rates analysis for roads and bridges.
5. MOST specification
6. National building code and BIS Specification.
7. For water supply and sanitary works – Bangalore Water Supply and Sewerage Board (BWSSB) - Technical Specification.

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4.0 CONTRACTOR'S GENERAL OBLIGATION

4.1 SITE RESPONSIBILITY CHART

4.1.1 The Contractor shall submit, within 15 days after the Date of Commencement of the Contract, a site responsibility chart to show the functions and responsibilities of various personnel from the Project Manager to the workmen responsible for executing the Works, as well as the functions and responsibilities of the sub-contractors involved.

4.1.2 The key representatives (Project Manager, Design Co-ordinator, Construction Managers, Safety and site engineers and site supervisors, etc.) proposed by the Contractor shall possess similar work experiences in construction works as required for this Contract. The Contractor shall submit curriculum vitae (CV) and particulars of the project team including name, designation, appointment, qualification, relevant experience and responsibilities, etc. to the Engineer for approval.

4.1.3 The Contractor shall submit an Organisation chart including but not limited to the following project team members, all full-time on site unless otherwise specified, to manage the Works:

a) Project Manager with at least 10 years relevant experience and a Degree in Civil Engineering.

b) Site Engineers in Civil &MEP with at least three (3) years relevant experience in respective branches and a Degree in Engineering in respective branches;

c) Planning engineer with at least five (5) years relevant experience with a Degree in Civil Engineering.;

d) Plant Engineer with Degree /Diploma in Mechanical Engineering with three or seven (3/7) years of relevant experience respectively;

e) Quality controlling Engineer with Degree /Diploma in Civil Engineering with three or seven (3/7) years of relevant experience respectively;

f) Quantity Surveyor Degree /Diploma in Civil Engineering with three or seven (3/7) years of relevant experience respectively;

g) Land Surveyor (part-time);

h) Safety and Health Supervisor;

i) Site Supervisor/Foreman with relevant experience in road construction and traffic control with certificate in Pavement Construction and Maintenance awarded by _____ (Authority);

j) Qualified Supervisor for Temporary Traffic Control;

k) Licensed Cable Detection Worker, whenever required; and

l) Lifting Supervisors with certificate in Lifting Operations awarded by Building _____ (Authority).

The Contractor shall note that the number of personnel specified above is the minimum required for the Contract. The actual number of personnel shall be increased by the Contractor where situations arise in relation to the Works which require more supervision effort.

4.2 SETTING OUT AND EXISTING LEVELS

4.2.1 The Contractor shall take levels and set out for the whole of the Works including other surveying works throughout the construction and Defects Liability Period as and when required by the Engineer.

4.2.2 The Contractor shall determine and mark out on site the minimum clearance where the proposed structures cross over the existing carriageways and shall inform the Engineer within a month of award of the Contract.

4.2.3 The information on existing levels as shown on the Drawings is provided in good faith for the general guidance of the Contractor. The Contractor is to note that accuracy of information shown on the Drawings is not guaranteed. The Contractor shall visit the site and carry out field surveys if he considers it necessary to ascertain the full extent of the Works.

4.2.4 Within one week after the commencement of the Works, the Contractor shall submit to the Engineer for his verification and endorsement, records of levels of the existing site condition. Similarly, the Contractor shall submit the as-constructed levels of the site to the Engineer upon completion of the Works. Such records shall be certified and endorsed by a Registered Surveyor engaged by the Contractor at his own cost.

4.3 SITE MEETINGS

4.3.1 The Contractor shall provide all facilities at the site for the purpose of conducting joint site meetings between the Contractor and the Engineer (or his representatives), as well as ensure notice of meetings and participation by all relevant department agencies – BWSSB, BESCOM, Traffic POLICE - to monitor the progress of the Works.

4.3.2 Site progress meetings shall be convened at a minimum of once a month as well as when arranged by the Engineer. A full progress review will be conducted by the Contractor at these meetings and minutes recorded and sent to all Agencies. All sub-contracotor representatives shall also be present at these project review meetings

4.3.3 The Contractor's key representatives (Project Manager, Construction Managers, Safety and Health Officer, Environmental Control Officer and site engineers, etc.) are required to attend daily pre-work meeting punctually prior to commencement of site activities and submit daily and weekly works programme to the Engineer (or his representatives).

4.3.4 The Contractor will be required to attend meeting as and when notified and he shall make available a responsible person with authority to accept and make decisions and to act on his behalf. All site meetings shall be properly minuted and recorded by the Contractor and a copy of the minutes for each meeting shall be submitted to the Engineer for record purpose.

4.4 ACCESS FACILITIES FOR CHECKING WORKS

4.4.1 The Contractor shall provide at all times during the execution of the Works and the Defects Liability Period proper means of access with ladders, gangways, etc., and necessary attendance to move and adapt the same as directed, for the inspection or measurement of the Works by the Engineer or his representatives.

4.4.2 The Contractor shall provide all assistance, supply and maintain necessary facilities such as digital camera with adequate flash, close-up and zoom lenses, torch, measuring staff, etc. to enable the Engineer or his representatives to check and record the progress of Works.

4.5 OBSTRUCTION AT SITE

4.5.1 The Contractor must clear all obstacles which may cause obstruction to the Works. In the case of a parked vehicle, he shall, at the direction of the Engineer's representatives, serve notice to inform the driver to move it from site.

4.5.2 All construction plant and equipment shall not be parked on main roads and shall be moved from site as soon as work completes. In cases where the construction plant and equipment are left on site for the purpose of works on the next day, then, subject to the Engineer's approval, the Contractor shall ensure that such items are properly parked and that there is no obstruction to traffic flow.

4.6 NOISE CONTROL

4.6.1 The Contractor shall maintain noise levels for construction premises as stipulated under the Environmental Pollution Control (Control of Noise at Construction Site Regulations) (Amended) Regulations latest and subsidiary legislation and any amendments and/or re-enactment thereto.

4.6.2 All vehicles and mechanical construction plants used for the purpose of the Works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order.

4.6.3 All compressors shall be sound reduced models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturer.

4.6.4 All construction plants shall, where appropriate, be muffled and the Engineer shall have the authority to instruct the Contractor to shut down any which is not adequately muffled and to remove it from the Site.

4.6.5 All machines in intermittent use shall be shut down or throttled down to a minimum in the intervening periods between works. Noise emitting equipment running continuously shall be housed in a suitable acoustic enclosure.

4.6.6 Constructional plant shall be maintained in good and workmanlike condition so that extraneous noises from mechanical vibration, creaking and squeaking are reduced to an acceptable minimum.

4.6.7 Percussive methods will not be permitted for breaking concrete. Equipment which breaks concrete or used for bending or such other equipment as is approved by the Engineer shall be used.

4.6.8 All pile driving, demolition works etc shall be carried out by a recognised noise reducing system. Rotary drills and busters actuated by hydraulic or electrical power shall, where practicable, be used for excavating hard material. Noisy constructional plant shall be sited as far away as possible from occupied buildings. The use of barriers (noise barriers, site huts, acoustic sheds, screens or partitions) to absorb and or deflect noise away from occupied buildings shall be employed wherever possible.

4.6.9 Care shall be taken when loading or unloading vehicles, dismantling scaffolding or moving materials to reduce impact noise. Access to the working areas shall be such as to ensure minimum disturbance to persons in occupied buildings. The Contractor shall not execute any of the works or carry out maintenance of construction plants in such a manner as to cause nuisance unless the work is absolutely necessary to save life or property or for the safety of the works in which case the Contractor shall immediately advise the Engineer.

4.6.10 The Contractor shall provide all that is necessary, including competent and qualified personnel and suitable equipment for all the measurements and recordings of the noise levels as and when requested by the Engineer during the Contract duration and submit a detailed report including analysis within two days after the day of measurements to the Engineer.

4.6.11 The Contractor shall provide and use construction plant and equipment, which have been specifically designed or modified to reduce the noise of normal operation.

4.6.12 All night work after 6pm shall be subject to the approval of the Engineer.

4.7 PROJECT MANAGEMENT CONSULTANTS- PMC

4.7.1 The Employer will engage an Project Management Consultants (PMC) as required under the _____ including any subsequent amendments and subsidiary legislation.

4.7.2 The PMC will supervise, review, evaluate and assess the Contractor's proposal for Permanent Works, Temporary Works, risk analysis report, instrumentation monitoring strategy and other submissions from the Contractor in relation to this Contract.

4.7.3 The Contractor shall provide necessary information and co-operation to the appointed (PMC) so as to enable him to discharge his statutory duties under the _____satisfactorily.

5. PROGRAMMING &PLANNING

BASELINE PROGRAMME

5.1.1 Within 15 days after the award of the Contract, the Contractor shall submit six (6) hardcopies and one (1) softcopy of a Baseline Programme to the Engineer for his acceptance. The Contractor's project manager shall make a presentation of his proposed programme to the Engineer to demonstrate his understanding of the contract requirements, planning, control, monitoring of works programme and resources of the Works. Upon acceptance of the Baseline Programme by the Engineer, the Contractor shall adhere to it strictly. The Contractor shall ensure that preparation, updating and revision of programme of works are carried out by experienced and qualified personnel.

5.1.2 The Baseline Programme shall be developed by the computerised Critical Path Method (CPM) using the Precedence Diagramming Method (PDM). The programming software shall be Primavera Project Planner or Microsoft Project or Open Plan, subject to the Engineer's approval.

5.1.3 Programme Details

The level of programme development, information and detail shall be sufficient to accurately define the Contractor's intentions and sequence of works. The programme shall show every significant activity required for the completion of the Contract that include but not limited to the following:

a. key dates, milestones, interface and handover dates, phased completion and completion of Whole of the Works;

b. Contractor's design (where applicable) including dates for submission to and acceptance by the Engineer;

c. submission and acceptance of road diversion plan, utilities diversion plan, Temporary Works and other works requiring approvals from authorities;

d. procurement of major equipment and material, in particular long lead items and the delivery to site;

e. all on-site works, including preliminary and Temporary Works by the Contractor, his sub-contractors and suppliers;

f. any off-site work such as the production and/or fabrication of any components or materials;

g. the different stages of traffic diversion and specific requirements with regard to traffic aspects as given in this Specification;

h. interface with Utility Agencies and work done by Utility Agencies or the Contractor for diversion;

i. interface with other contracts/contractors; and

j. any outside influence which will or may affect the progress of Works.

PROGRESS REPORT

5.2.1 Monthly Contractor's Report

Not later than the fifth day of each month, the Contractor shall prepare and deliver to the Engineer four (4) copies of the Contractor's monthly report with progress photographs (hereafter referred to as the "Contractor's Report") on the execution of the Works in the preceding month. One softcopy of the updated Baseline Programme shall also be submitted.

5.2.2 The Report shall be typed, printed and bound. It shall be supported by graphics and photographs. Unless the Engineer directs otherwise, the Contractor's Report shall comprise:

a. Introduction;

b. Monthly Progress Report;

c. Performance Report;

d. Status Report; and

e. Narrative Report.

5.2.3 Monthly/Weekly/Daily Progress

a. The Contractor shall keep a record of monthly progress of Works on site in the form of colour photographs with appropriate annotations and dates stated;

b. The Contractor shall deliver daily to the Engineer's representative a report as to the number of workmen employed on the works in each trade, etc. and records of delivery notes of all goods and materials delivered to the site;

c. Not later than 8.30 a.m. on each Saturday, the Contractor shall deliver to the Engineer a programme of the works he intends to execute in the following week. The programme shall of a format as agreed with the Engineer and shall clearly show the nature of those works, their locations any significant manpower, material and plant resource required therefore. The programme shall identify the Contractor's personnel who will be responsible for the supervision of the various activities; and

d. Not later than 8.30 a.m. on each working day, the Contractor shall deliver to the Engineer a programme of the works he intends to execute on that day. The programme shall be of a format as agreed with the Engineer and its requirements shall be as those for the weekly programme of works.

6.0 DESIGN REQUIREMENT

6.1 SAMPLES OF MATERIALS AND LIGHT FITTING

6.1.1 The Employer will provide additional detailed drawings as needed and developed during the course of the Project implementation, to guide the works details. The Contractor shall supply suggested details and construction drawings and technical literatures (specifications, brochures, material data), proposed material samples of items as required in the working drawings to demonstrate full compliance of the Employer's requirements and specifications, or as required to supplement the working drawings.

6.1.2 All construction drawings, technical literatures and proposed material samples shall be submitted for the Employer's approval prior to commencement of the Works and before any orders or bulk delivery of the said materials to the site is made. All samples which are approved will indicate the standard to be maintained in the execution of the Works and shall be Engineer marked and retained by the Engineer until the completion of the Works. In the case of rejection, further samples shall be submitted until they are approved. The Engineer may reject any material or workmanship which in his opinion, is not up to the approved standard. All samples submitted shall be deemed included in the Contract Sum.

6.1.3 Where reference is made to trade names or manufacturer's catalogue numbers, the Contractor may use any article or material similar and equal to those described only when specifically approved by the Engineer. No claim due to neglect in this respect shall be entertained.

6.2 TRAFFIC SIGNS, ROAD MARKINGS& ROAD FURNITURE

6.2.1 The Contractor shall provide all signage, road furniture (including supports and foundations) and road markings in accordance with the details and locations shown on the Employer's Drawings and as specified in the Materials and Workmanship Specification. Thermoplastic materials as per section MoRTH & IRC shall be used for all road markings.

6.2.2 The Contractor shall provide additional signage if deem necessary in his design or as instructed by the Engineer.

6.2.3 The Engineer's acceptance shall be obtained before any installation on site.

6.3 INSTRUMENTATION AND MONITORING

6.3.1 The Contractor shall carry out instrumentation and monitoring works. The Contractor shall comply with the minimum instrumentation given in the Design Criteria. Upon award of the Contract, the Contractor shall, in addition to the above, propose additional instrumentations to suit his construction method / temporary works scheme, and to ensure the safety and control of the Works subject to the approval of the SO.

6.3.2 The Contractor shall carry out installation of instruments and monitoring of the Works in a timely and safe manner.

7. SAFETY &ENVIRONMENTAL CONSIDERATAION

7.1.1 The Contractor shall throughout the progress of the works have full regard for the safety, health and welfare of all persons entitled to be upon the site and shall keep the site and works in an orderly state, appropriate to the avoidance of danger to such persons and shall maintain at his own cost all ventilation, lights, security personnel, fences, warning signs, watching, etc. When and where necessary or required by the engineer or by any statutory or other agency for the protection of the works or for the safety and convenience of the public or other.

7.1.2 The Contractor is advised to take note under the conditions of contract which stipulates the demerit points and administrative charges for safety and housekeeping infringements.

7.2 OCCUPATIONAL SAFETY & HEALTH (OSH) COMPETENCE & RESOURCE ALLOCATION ASSESSMENT

7.2.1 The Employer aims to set a standard of Occupational Safety and Health environment consistent with the best international practices for the management of its project.

8. TRAFFIC CONTROL AND ROAD SAFETY AT WORK ZONE

8.1 TRAFFIC CONTROL AND ROAD SAFETY

8.1.1 The Contractor shall comply strictly with the specifications given in the code of practice for traffic control at work zone which sets out the requirements, standards and procedures and provides guidance to implement traffic control plan necessary for carrying out work activities on the road so as to protect the public, equipment and workmen.

8.1.2 The Contractor shall submit detailed construction sequence and detailed traffic diversion schemes including scaled cross-sectional drawings and layout plans to the Employer for Tender evaluation. All construction sequences proposed by the Contractor shall have primary considerations for the safety of road users. Protective measures shall be presented to the Employer for evaluation and approval before award of Tender.

8.1.3 The Contractor shall note the traffic conditions at the Site and his proposed traffic diversion schemes shall be based on his investigation and appreciation of the Site for the completion of the whole of the Works.

8.1.4 The Contractor shall note that the construction methods and schedule of his Works proposed shall not cause any disruption to traffic flow. All accesses to premises affected shall be maintained at all times. Unless authorised in writing by the Engineer, the Contractor shall not be allowed to close off any traffic lane along any existing roads. He shall not be allowed to place, or cause obstruction near or on the carriageway in a manner which would cause a reduction in the traffic capacity of the road.

8.1.5 Closure of any traffic lane or any carriageway required shall be implemented in accordance with the approved traffic diversion scheme for all affected traffic movements.

8.1.6 All temporary traffic diversion schemes proposed for the Works shall be provided with a one-to-one replacement of all affected traffic lanes, footpath, pedestrian crossing, bus-stop and other road related facilities. Alternative pedestrian crossing facilities shall be provided prior to the dismantling of existing facilities.

8.1.7 The Contractor shall adhere to the minimum provisions of work zone safety as per IRC SP55. The Contractor's qualified engineer shall submit all detailed temporary traffic diversion schemes for the Works to the Engineer and relevant authorities including the Traffic Police, and etc. for approval. These proposed traffic diversion schemes shall be submitted in properly scaled engineering drawings and shall be supported with traffic analysis report. Such drawings shall include traffic layout plans showing all traffic signs, lane-markings, advance warning and directional signs etc., longitudinal section drawings and all other drawings necessary for the implementation of the schemes. The Contractor shall comply with the requirements of all relevant authorities in his implementation of the temporary traffic diversion scheme.

8.1.8 The temporary diversion road pavement shall be Asphalted or equivalent.

8.1.9 The Contractor shall also liase, co-ordinate with and assist the Employer in scheming and designing the provision of adequate street lighting along the diversion route. Foundations for lamp-posts and all ancillary works shall be provided by the Contractor.

8.1.10 For traffic diversion schemes which are to be implemented for a period of more than 3 months, all lane-markings shall be done in thermoplastic material. Lane-markings for each stage of the traffic diversion shall be maintained and, if necessary, replaced and repainted in good condition at all times to the satisfaction of the Engineer. All existing lane markings affected by the temporary diversion of traffic are to be properly grinded off. Diverted lane/arrow markings must be properly painted and must not be confused with the existing markings.

8.1.11 The Contractor shall note that all vehicular impact guardrails or kerbs removed during the construction stage shall be replaced with water filled safety barriers complete with safety reflective discs.

9. UTILITY SERVICES

9.1 EXISTING SERVICES

9.1.1 Prior to commencement of any part of the works under the contract, the Contractor shall locate (by cutting trial trenches, using cable detector, etc.), the exact positions of all existing sewer mains, gas mains, water mains, electrical cables, telecommunication cables and other utility services. The Contractor shall take all precautionary measures to prevent damage to the services and minimize all inconvenience to residents, during the cutting of trial trenches.

9.1.2 Where utility services which are in the way of the works are not diverted or not to be diverted, they must be supported and protected during the construction of the works. The Contractor shall submit to the engineer and the relevant utility services authorities, calculations and detailed drawings, endorsed by an independent professional engineer, for the necessary support and protection of these services. Any requirement that may be imposed by the utility services authorities in this connection shall be met fully and without compromise. Approval of the contractor's proposals must be obtained from the respective utility services authorities prior to commencement of works affecting these utility services.

9.1.3 The Contractor shall note that the employer will not be responsible for any damage of the existing services caused by the construction works, etc. The Contractor will be liable for any damage to the existing services and carry out the repair works to the satisfaction of the engineer and the appropriate utility services authorities at his own expense.

9.1.4 All relevant utility services authorities shall be kept informed of any changes affecting their services.

10. DRAINS

10.1 DIVERSION AND MAINTENANCE OF EXIS TING DRAIN

Upon award of the contract and prior to the commencement of the works, the contractor shall submit to the engineer his proposal for the diversion and maintenance of existing drains for the whole period of construction to the engineer and respective authority for approval. The contractor shall be responsible for the maintenance of the free flow of the drains at all times. At no time shall the contractor obstruct or reduce the free flow area of the existing canal / drain without the prior approval of the engineer and respective authority.

If, in the opinion of the engineer, the contractor has not carried out or is unable to carry out such maintenance of temporary drain diversion to his satisfaction, the engineer reserves the right to employ others to carry out such works and deduct the cost of all such works from any money due to or to become due to the contractor.

The contractor shall remove all temporary works as soon as these are no longer required and reinstate the site to its original condition to the satisfaction of the engineer and respective authority.

The contractor shall take all necessary precautions to prevent any damage to the existing culverts and drains, if these are not proposed for re construction.

Existing drains/culverts/sumps etc. Made redundant when the new drains / culverts / sumps are completed shall be completely removed and filled with suitable materials to the satisfactory of the Engineer.

11. MAINTENANCE

11.1 MAINTENANCE DURING CONSTRUCTION: During construction, the contractor shall maintain, keep tidy and make good all carriageways/pavement structures, kerbs, footpaths, lane markings and turfing within the contract limit to a standard equivalent to existing condition and to the satisfaction of the engineer. The contractor shall ensure that free drainage of road carriageways is maintained at all times. Adequate side-outlets including scuppers, drop -inlet chambers, etc., shall be provided and maintained to facilitate the outflow of the carriageway water. Existing scuppers, road-side drains and other carriage-drainage facilities shall be kept in unobstructed and serviceable condition in the interim till the works are effectively drained by the new carriage-drainage facilities such as drop-inlet chambers, etc. To be constructed under this contract. Additional temporary drop inlet chambers, scuppers to prevent any ponding of water on any part of the carriageway shall be installed where necessary. Construction materials and debris shall have to be suitably placed away from the roadside drains, scuppers and other road-drainage facilities to avoid obstruction to these drainage channels. The contractor shall ensure that the existing structures not affected by the works are properly protected to the satisfaction of the engineer. He shall provide a system of monitoring the stability and structural integrity of the existing structures and ensure that these are fully integrated in his construction methods for the works.

11.2 MAINTENANCE DURING & AFTE R DEFECTS LIABILITY PERIOD

The Contractor shall regularly maintain all Works in a tidy and satisfactory condition and shall make

good any defect which may appear during the Defects Liability Period (DLP). For painted items of structures and roadside furniture, the Contractor shall provide everything necessary and repaint all such items with 2 coats of approved paints at the end of the Defects Liability Period (DLP). All defects such as rust, chipped or dented surfaces, etc. shall be satisfactorily attended to prior to repainting. In this respect, the Contractor shall arrange a joint site meeting with the Engineer before any remedial works is carried out, and he shall comply with all requirements pertaining to the Engineer. Repainting of road lines, lanes and arrow markings shall not be required during or after the DLP.

The maintenance of trees, plants and grass shall include watering, weeding, fertilising and cutting twice per month as specified and maintaining its growth in a tidy and satisfactory state.

The Contractor shall notify the Engineer prior to commencement and on completion of each trimming of trees, shrubs, turfing etc. in order that a joint site inspection can be made.

Post DLP, Maintenance clause is applicable for 36months as per BBMP's circular No.A/P.S.R/G-5317/12-13 issued dated 24/09/2012. During this period, the Contractor shall maintain drains, landscaping and other works to the satisfaction of the Engineer and the employer.

11.3 INSPECTION OF WORKS DURING DEFECTS LIABILITY PERIOD

During the DLP of 24 months post construction, the Contractor shall carry out monthly inspection of the Works for any defects. He is required to immediately rectify all defects determined during the inspection or when informed by the Engineer and complete the rectification works within the timeframe stipulated by the Engineer.

The Contractor shall also attend monthly meetings conducted by the Engineer to monitor the status of rectification works and to clear any outstanding matters regarding the Contract. All meetings shall be properly minuted and recorded.

Three (3) months before the end of the DLP, the Contractor shall arrange and conduct a joint site inspection with his pertinent subcontractors and suppliers to determine any defective works. Rectification work for all the defects identified shall be completed within a month.

At the end of the DLP, the Contractor shall take all necessary action to ensure that all the Works are free from any defects and in a good and satisfactory condition for handing over to the relevant authorities for maintenance. The Engineer and the relevant authorities shall ascertain the acceptability of the Works to move into the "Maintenance". Phase of the contract

11.4 PROVISION OF WASHBAY

The Contractor shall provide properly designated area as washbay at all entrances/exits to the Site and ensure that all vehicles, plant or equipment leaving the Site are properly cleaned before travelling on public roads. The location of the washbays shall be subject to the approval of the Engineer.

12. CONSTRUCTION

12.1 METHOD STATEMENTS

12.1.1 The contractor shall submit comprehensive method statements for all temporary works before the start of any works to the engineer's approval. Submission of this method statement shall be sufficiently (minimum 3 weeks) in advance of the construction of the works to allow adequate time for review, resubmission as necessary and future review. The statement shall clearly identify in details, the contractor's proposed methods (including machinery/equipment material and other resource needed), sequence of working with necessary plans, drawings and calculations.

12.1.2 Designs and drawings for Temporary Works shall be submitted for the acceptance of the Engineer and relevant authorities.

12.1.3 All Temporary Works shall be removed after use and approval must be sought from the Engineer with justification if otherwise.

12.1.4 Bentonite slurry waste shall not be discharged into the public sewerage and drainage systems.

12.2 SITE CLEARANCE AND DEMOLITION WORKS

12.2.1 The Contractor shall clear site of shrubs, bushes and all other forms of vegetation with the prior permission of the Engineer including grubbing up roots, etc. The Contractor shall note that felling of trees without the written consent of the Engineer is strictly prohibited.

12.2.2 The Contractor shall demolish and remove with the prior permission of the Engineer all existing structures, obstructions and fixtures made redundant by the Works which are within the overall road reserve or Contract Limit and/or related with the proposed Works.

12.2.3 The Contractor shall break up and remove (or seal up if directed by the Engineer) existing redundant pavement, scupper drains, pipes, and backfill with approved materials to the required level unless otherwise indicated.

12.2.4 The Contractor shall break up existing redundant road kerbs and foundations, cart away debris and backfill with approved materials to the required level unless otherwise indicated.

12.2.5 The Contractor shall remove debris and surplus earth from Site to the Engineer suggested location.

12.2.6 The Contractor shall raise all other items e.g. boundary walls, fixtures, fences, etc. affected by road raising but not specifically mentioned herein including making good all works affected on completion.

12.2.7 The Contractor shall reinstate all damaged roads, drains, kerbs, fencing, boundary walls, fixtures and all other works disturbed to the satisfaction of the Engineer.

12.2.8 The Contractor shall liaise with Utility Services Departments, telecommunications operators such as BSNL, Airtel, etc. for the location and relocation of all pipes, cables, main ducts, posts, manholes, boxes along or beneath the road reserve or in any part of the work in order to ensure that all service requirements are met before commencement of the work.

12.3 RECONSTRUCTION, RELOCATION AND REINSTATEMENT WORKS

12.3.1 The Contractor shall visit the Site to ascertain himself, prior to tender submission, all work items affected by the Works which require raising, demolition, reconstruction, extension or relocation including fence, boundary wall, entrance, gate, driveway, compound drains, posts, lights, sign boards, fixtures, services such as cabling, sanitary, plumbing, sewers, water pipes, landscaping features such as turfing, plants, trees, flower troughs belonging to statutory or private properties, etc.

12.3.2 The Contractor shall liaise closely with the owners of the private houses and shop houses and owners of other private properties on any reconstruction, reinstatement and relocation works. The Contractor shall plan his construction works so as to cause minimum obstruction and inconvenience to the owners and the public. The Contractor shall take note of the existing facilities such as tiling, fencing, automatic gate, boundary walls, fixtures, etc. of these houses. At the end of any construction work, these facilities shall be reinstated to match existing to the satisfaction of the private property owners. The Contractor shall liaise with these owners

his cons...

11.2 MAINTENANCE DU...

The Contractor shall regularly maintain all Works ...

before carrying out his work.

12.3.3 The Contractor shall seek approval from the Engineer before any work can be carried out.

12.3.4 The Contractor shall be fully responsible for the suitability, adequacy, integrity, durability and practicality of the design as set out in the Drawings, Specifications, manuals, calculations and other information submitted for the acceptance of the Engineer, including any subsequent amendments of such design.

12.3.5 The Contractor shall not proceed with the execution of any reinstatement works until he has submitted to the Engineer, work method statements, design calculations, specifications, and other information as shall be necessary to demonstrate the suitability, adequacy, integrity, durability and practicality of such design and the Engineer has issued his acceptance in writing of such design. Acceptance by the Engineer of such submission shall not relieve or in any way limit the responsibility of the Contractor. All such submissions shall be duly endorsed by the Contractor's PE.

12.3.6 Such submission shall be made well in advance to enable the Engineer sufficient time to check, study and comment on the Contractor's proposal without affecting the progress of the Works.

12.3.7 The Contractor may in the course of his works be required to execute works beyond the contract boundary encroaching into other's properties. The Contractor shall exercise strict control over his workmen not to use or trespass into, any of the properties without prior written permission of the property owners. Any fence or fence walls dismantled should be replaced immediately or other equivalent to ensure the security of affected properties.

12.3.8 In cases where the Contractor need to enter private land to execute works where prior permission have not been obtained, the Contractor must obtain the necessary permission from the owners before entering the lands. The Contractor shall complete the works in the private land within the shortest period and shall not store any material, equipment and plant within the private lands.

12.3.9 The Contractor shall take precautions to avoid damaging the existing signboards during resiting. Should the signboards be damaged during the course of the works, the Contractor shall replace the signboard with a new one to match the existing.

12.3.10 In executing any of the relocation works, the Contractor shall make good any deficiency in length, height, amount of materials (e.g. fence, fence walls, boundary walls, etc.) with new materials. The Contractor shall also replace all damaged or corroded works or works that cannot be relocated satisfactorily (e.g. foundations, walls, cables etc.) to the Engineer's satisfaction.

12.3.11 The Contractor is required to reinstate all landscaping areas including turfing, any plants or trees affected by the works. The costs of the reinstatement works shall be deemed to be included in the Contract Sum.

12.4 SITE CONTROL AND TESTING INSTRUMENTS

12.4.1 The Contractor shall provide all the necessary labour, plant, tools, instruments and materials for carrying out all tests at the Site including the provision of all necessary transport for the transportation of test materials, samples and the Engineer, etc. to and from an approved laboratory as and when directed by the Engineer or his appointed site representative.

12.4.2 The Contractor shall provide penetrometer on Site. The Contractor shall maintain this instrument in good condition at all times throughout the Contract Period. The instrument must be approved by the Engineer before it is used.

12.4.3 The following control tests on road sub-grade and sub-base shall be carried out by the Contractor in the presence of the Engineer:

a. Minimum three numbers in-situ dry density tests with a Volumenometer at every 50m intervals per carriageway;

b. Minimum three number in-situ test with a cone penetrometer at 25m intervals per carriageway; and

c. Any other tests that the Engineer may carry out from time to time during the Contract period.

12.4.4 If settlement plates and/or markers are required, the Contractor shall maintain, protect and monitor the settlement plates and/or markers until the expiry of the Defects Liability Period.

12.4.5 The Contractor shall provide at all times, electronic detectors of an approved brand to be used on Site to help in locating utilities services. It is to be noted that the deployment of the electronic device will not absolve the Contractor his responsibility in locating the exact locations of all existing services and all readings of electronic device are to be confined by cutting trial trenches.

12.4.6 Field Laboratory

The Contractor shall provide and maintain adequately equipped Field Laboratory as required for Site Control on the Quality of Material and the Works. It shall have a minimum of 40 Sqm Area. The Field Laboratory shall be located as directed by the Employer or his approved Representative. It shall be provided with Amenities like Water Supply, Electric Supply, etc. The Laboratory will have all Services, Furniture, Equipments, etc. Minimum of the following Items shall be provided in the Field Laboratory. Any Additional Items as required for Testing / Evaluation in line with the Standard Procedures and Codal Provisions shall also be provided.

12.4.6.1 Equipments required – General

i. Oven – Electricity Operated, Thermostatically Controlled, Range upto 200^{0}C, Sensitivity 1^{0}C — 1 No.

ii. Plat form balance 300 kg capacity — 1 No.

iii. Balance 20 kg Capacity – Self Indicating Type — 1 No.

iv. Electronic Balance 5kg Capacity – accuracy 0.5 gm — 1 No.

v. Water Bath – Electrically Operated and Thermostatically Controlled with Adjustable Shelves, Sensitivity 10^{0}C — 1 No.

vi. Thermometers
   a. Mercury – in – Glass Thermometer ranges 0 to 250^{0}C — 4 Nos. each
   b. Mercury – in – Steel Thermometer with 30 cm Stem, ranges up to 300^{0}C

vii. Glass Wares, Spatulas, Wire Gauzes, Steel Scales, Measuring Tape, Casseroles, Pans, Enameled Trays of Assorted Sizes, Pestle Mortar Porcelain Dishes, Gunny Bags, Plastic Bags, Chemicals, Digging Tools like Pickaxes, Shovels, etc. — As Required

viii. Set of IS Sieves with Lid and Pans 450mm Diameter with Sizes of 63 mm, 53mm, 37.5mm 26.5mm, 13.2mm, 9.5mm 6.7mm and 4.75mm 200 mm Diameter of Sizes 2.36 mm, 2mm, 1.18 mm, 600 micron, 425 micron, 300 micron, 150 micron and 75 micron — 1 Set

ix. Water Testing Kit for pH, SO_3 and Cl — 1 Set

x. First Aid Box — 1 Set

12.4.6.2 Equipments required – Soil & Aggregate

i. Atterberg's Limits (Liquid and Plastic Limits) Determination Apparatus — 1 Set

ii. Compaction Test Equipment both 2.5 kg and 4.5 kg Rammers (Light and Heavy Compact Efforts) — 1 Set

iii. Dry Bulk Density Test Apparatus (Sand Pouring Cylinder, Tray, Can, etc.)complete — 1 Set

iv. Speedy Moisture Meter complete with Chemicals — 1 Set

v. Pothole Auger with Extensions — 1 Set

vi. Core Cutter Apparatus complete with Dolly, Rammer, etc. — 1 Set

vii. Flakiness and Elongation Test Gauges — 1 Set

viii. Standard Measures of 30, 15 and 3 litres Capacity along with Standard Tamping Rod

12.4.6.3 Equipments required – Cement & Cement Concrete

i. Slump Test Apparatus	1 Set
ii. Compression and Flexural Strength Testing Machine of 200T Capacity with Additional Diameter for Flexural Testing	1 Set
iii. Cube Moulds for Concrete Tests	40 Nos.
iv. Surface Moisture and Density Meter for Soil, Aggregate and Concrete	1 No.

12.5 MONITORING WORK ON ADJOINING PROPERTIES/STRUCTURES AND SURROUNDING GROUND

12.5.1 The Contractor shall provide and implement an programme to monitor the effect of excavation, demolition and compaction works or existing structures, including supply, installation, monitoring, maintenance of all submissions of all results by a professional engineering consultant, etc. all in accordance with the Materials a Workmanship Specification.

12.5.2 The Contractor shall submit his detailed instrumentation programme and locations for the adjoining properties/structures, proposed structures and surrounding ground to the Engineer and the relevant authorities for approval prior to commencement of works.

12.5.3 The duration of the instrumentation period shall be the Contract period including any extension of time and the whole of Defects Liability Period.

12.5.4 Survey bench marks and datum readings of all instruments must be taken before commencement of any works. No excavation works, demolition works and compaction works shall commence until the instrumentation programme has been approved and all necessary instrumentation are properly installed, calibrated and functioning.

12.5.5 The monitoring system must include its own independent power supply and no reliance should be placed on obtaining power supplies from the surrounding buildings or other public facilities and utilities.

12.5.6 The Contractor shall be required to carry out additional monitoring in critical situations where the Engineer deems that the safety of the surrounding structures, adjoining properties, proposed structures and public is at risk. Under such circumstances, the Contractor shall out the monitoring work at a frequency of twice a day or as requested by Engineer and to mobilise additional suitable equipment and trained personnel within 24 hours of receiving instruction from the Engineer. No claims for extra cost or time incurred by the Contractor as a result of such additional monitoring work shall be allowed.

12.5.7 For the avoidance of doubt, construction period shall mean period from the commencement date stated in the Letter of Acceptance up to the Date of Substantial Completion.

12.5.8 The minimum frequency of readings to be taken for the instrumentation programme during Defects Liability Period shall be once a month, subjected to the approval from the Engineer.

12.5.9 The Contractor shall provide, install and protect all instrumentation equipment installed and in use during the Contract period including removal upon completion. Any instrumentation equipment found not in working condition shall be replaced by the Contractor immediately

upon detection and all replacement cost shall be deemed included in the Contract Sum.

12.5.10 The appointment of the geotechnical instrumentation specialist by the Contractor shall be subject to the Engineer's approval.

12.5.11 The Contractor shall submit four (4) sets of weekly interpretive monitoring report analysed and interpreted by the Professional Engineer (PE) for Temporary Works. The PE for Temporary Works shall also prepare a report duly endorsed by him and make recommendations, if any, regarding prevention of damage to surrounding structures and services and the safety of the Works. The Contractor shall carry out the PE's recommendation immediately at his own cost.

12.6 TEMPORARY WORKS

12.6.1 The Contractor shall employ a Professional Engineer (PE) to design the Temporary Works. The PE responsible for the design of Temporary Works shall be an independent person/consultant, not under direct employment of the Contractor's firm. The PE must be registered with the City Corporation or Technical Body like, Indian Institute of Engineers, etc. He shall be responsible for submission to the relevant authorities for approval of the Temporary Works for construction. The PE shall inspect all Temporary Works and ensure compliance with requirements in the design and as stipulated by the relevant authorities. He is also responsible for recommending and implementing any modification and rectification of the Temporary Works as necessary, subject to the Engineer's approval.

12.6.2 Six (6) copies of the design submissions shall be given well in advance of the date indicated on the construction programme for the commencement of the activity. The Contractor shall allow for sufficient lead time in obtaining the necessary approvals from relevant authorities and clearance by Qualified Person (Supervision) engaged by the Employer. The Contractor shall make all amendments or corrections which the Engineer may require and re-submit the amended or corrected submissions until the drawings and/or calculations are finally accepted and approved by the relevant authorities.

12.6.3 The Contractor shall submit his PE Certificate stating that the Temporary Works have been constructed according to the design for all stages of Works. The PE must comply with the conditions as in the Contract Document. The PE shall ensure adequacies in the structural elements at all stages prior to proceeding to the next stage of Works and to conduct regular inspections on all Temporary Works.

12.6.4 Works shall not commence without the prior acceptance of the Engineer. If in the opinion of the Engineer and/or Qualified Person (Supervision) engaged by the Employer, any such temporary support proposed by the Contractor is deemed to be insufficient, the Engineer may order the provision of additional supports entirely at the Contractor's own expense. Any such instructions and/ or acceptance of the Contractor's design proposal for the Temporary Works given by the Engineer and/or Qualified Person (Supervision) engaged by the Employer shall not relieve the Contractor of his responsibility for the proper design and safe execution of the Temporary Works and for the safety of all personnel.

12.6.5 The design of all Temporary Works shall comply with the requirements of the Design Criteria and Materials and Workmanship Specification for Civil & Structural Works. All Temporary Works shall be designed to the similar standards as the Permanent Works unless otherwise accepted by the Engineer in writing.

12.6.6 The Contractor shall note that all existing traffic movement at all existing roads shall be maintained during the period of construction. The Contractor shall note that no temporary / false work shall be erected on the roadway, including the centre median.

12.6.7 Monitoring of the movement of utility services shall be proposed for the acceptance of the Engineer and the relevant utility agencies.

12.6.8 Whilst the Engineer will attempt to respond to such submissions speedily, the Contractor shall in no case assume that it can be undertaken in less than twenty-one (21) working days.

12.6.9 The Contractor shall inspect the Temporary Works, supervise the loading of the Temporary Works and ensure the design criteria are not invalidated.

12.6.10 The Contractor shall ensure that the removal of the Temporary Works do not cause adverse effects on the completed structures, adjacent structures, roads and other properties and that full compliance with the dismantling proposals recommended by the PE and approved by the Engineer are met.

12.7 EARTHWORKS

12.7.1 The Contractor shall carry out earthworks to the required lines and levels, forming verge and embankments, including grading, levelling, trimming, ramming and consolidating all as specified and as shown on the Drawings.

12.7.2 The Contractor shall note that all levels stated in the Drawings are for information only. The Contractor is advised to verify the actual level on Site. He shall be deemed to have priced his tender based on the actual level on Site.

12.7.3 Fill shall be of approved earth material obtained from Contractor's own sources. The Contractor shall obtain Engineer's approval prior to using his earth filling materials for the Works.

12.7.4 The Contractor shall remove all surplus excavated materials from Site to the Contractor's own dump.

12.7.5 The Contractor shall be deemed to have taken into consideration difficulties due to the soil conditions affecting piling, concreting, etc. for the Works. The Contractor shall make his own arrangement such as providing temporary sheet piling, water pumps, temporary drains and temporary soil stabilising necessary to overcome the problem of water and vibration during the construction.

12.7.6 The Contractor shall note that certain parts of the existing areas within the Contract Limit (i.e. the low lying areas) would need to be backfilled up to the appropriate level before constructing the road works. Earth filling shall be with approved earth obtained from the Contractor's own source. Earth filling shall be placed and compacted in layers to the required levels. The Contractor shall seek the approval of the Engineer on the extent of area to be backfilled. He shall ensure that the backfill materials, method of backfilling and workmanship are to comply strictly with Materials and Workmanship Specification for Civil & Structural Works.

12.7.7 Where excavation works are to be executed under existing carriageways, for instance, construction of RCC Slab culvert, the Contractor shall design and erect steel decking fit for the purpose subject to Engineer's approval. The design of the steel decking shall be endorsed by a PE and the installation supervised and checked by the PE at the Contractor's own costs.

12.7.8 Where cutting of ground is to be executed next to existing structure, the Contractor shall submit method statement including stability check, protective measures and monitoring details to be duly endorsed by a PE prior to commencement of excavation. The Contractor shall monitor all readings taken and submit a detailed assessment report duly endorsed by his PE for Engineer's approval. All costs associated therewith shall be deemed to be included in the Contract Sum.

12.8 SLOPE CUTTING WORKS & REINSTATEMENT WORKS

12.8.1 The Contractor shall ensure proper safety measures are taken during the whole period of excavation works or related works.

12.8.2 The Contractor shall fully indemnify the Authority at all times against all liabilities of whatever nature and description which may be suffered by the Employer arising from the slope cutting work in State land.

12.8.3 The Contractor shall make good all works affected to the satisfaction of the respective developers or landowners after slope cutting work in State land.

12.8.4 The Contractor shall be responsible to reconstruct all boundary walls, fencings, fixtures, access roads, entrances/exits, footpaths, open drains and other facilities at the affected area after slope cutting work.

12.8.5 Reinstatement works shall be done in regular sections and in good workmanship to match the surrounding areas.

12.8.6 The Contractor shall liaise with the respective landowners or authorities for site inspection before commencement of work and after the completion of the reinstatement works.

12.8.7 The Defects Liability Period of 24 months shall commence upon the successful handing over of the above works to the respective owners.

12.8.8 The Contractor shall be responsible for the design and construction of all excavation systems. The Contractor shall engage a Professional Engineer who is experienced in Geotechnical Engineering to design and supervise and check on the excavation systems. It is the Contractor's responsibility and duty to conduct site investigation at his own expense to satisfy himself of the soil conditions of the site for the purpose of design and construction of the excavation systems. The Contractor shall engage a qualified engineer to provide standing supervision of all excavation works at Site.

12.8.9 The design of the excavation system shall take into consideration the use of suitable methods of installation of wall element and bracing system to minimise ground settlement, vibration of the surrounding structures and particularly heaving of the area. The methods and sequence of construction shall be clearly indicated.

12.8.10 The Contractor shall take every precaution during excavation to prevent base heave and piping. Any damages to completed works and surrounding structures caused by bases heave or piping shall be made good at the Contractor's expense and to the satisfaction of the Engineer.

12.8.11 Excavation shall be carried out in stages strictly in accordance to the proposed excavation method. Under no circumstances shall the Contractor be permitted to over excavate at any location of the excavation. Any over excavation shall be immediately backfilled with approved materials to the required level..

12.8.12 The Contractor shall immediately provide additional support or bracing to the wall if there is any sign of movement approaching the allowable limit and review the design. All such provisions shall be made at the Contractor's expense.

12.8.13 The Contractor shall note that all work programme and construction method are also subject to the approval of the other relevant authorities. He shall fully comply with all requirements, rules, regulations and Bye-Laws. The Contractor shall be deemed to have allowed for the time required for authorities' clearances in his programme and shall pay any dues as need for any license or other concessions granted.

12.8.14 The Contractor shall allow in his tender for any extra costs and expenses that may be incurred

due to inconvenience, idling of plants, labour or machinery arising from site, difficulties or obstructions of any form or nature and/or arising from compliance with any Rules, Regulations, Bye-Laws and Requirements of the relevant authorities.

12.9 KERBS AND FOUNDATIONS

12.9.1 The Contractor shall construct precast concrete kerb as per designs and laid jointed with cement mortar (1:3) to correct line and levels and proper connection to existing, including mass concrete foundation, painting, all as specified and shown on the Drawings.

12.10 DRAIN WORKS

As per the structural drawing issued to the contractor.

12.10.1 The Contractor shall construct RCC Lined drain including forming cascade, excavating, to proper line and gradient.

12.10.2 The Contractor shall construct R.C. C.drains inclusive concrete benching, hardcore packing, to the required lines and gradients including proper connections to drains etc. and all ancillary works.

12.10.3 The Contractor shall construct cast in-situ concrete RCC Slab culvert inclusive weep holes complete with concrete base, quarry dust backfill, parapet etc. and proper connection to drains, sumps at inlet and outlet ends to the required lines and levels and all ancillary works.

12.10.4 The Contractor shall design and construct temporary support to uphold and maintain the sides of earthwork by whatever means considered necessary. He shall be fully responsible for the suitability, adequacy, integrity, durability and practicality of the temporary support. The Contractor shall not proceed with the work until he has submitted the design of the temporary supports to the Engineer for approval. The design shall be duly endorsed and installation supervised and checked by the Contractor's PE.

12.11 PEDESTRIAN FACILITIES

As per the drawings issued to the contractor

12.11.1 The Contractor shall construct footpath as per the tender drawings.

12.12 TRAFFIC FACILITIES

12.12.1 The Contractor shall paint road markings, arrows, etc. with thermoplastic paint.

12.12.2 The Contractor shall supply and erect directional signs, traffic signs, plastic bollards, raised pavement markers etc. inclusive of support and mass concrete foundations and all ancillary works as shown on the Drawings. All traffic signs and directional signs shall be of retro-reflective sheeting or approved equivalent.

12.12.3 The Contractor shall paint road kerbs as shown on Drawings.

12.12.4 The Contractor shall re-site existing gantry sign, cantilever signs, information signs, directional signs and traffic signs affected, including cleaning the existing signs and erect at the new positions, inclusive of mass concrete foundation and all ancillary works as shown on the Drawings. The Contractor shall make or replace any damaged signs to the satisfaction of the Engineer.

12.12.5 The Contractor shall price for the removal/relocation of existing street lightings, sign boards,

street furniture and/or other road facilities which belongs to the private owners that fall outside the road reserve subject to the approval of the respective land owner.

12.13 REQUIREMENTS FOR DESIGN MIXES

12.13.1 The Engineer reserves the right to instruct the Contractor to modify and improve the mix design from time to time during the progress of work as and when he considers necessary to meet the requirements for design mixes. This shall not entitle the Contractor to any extra payment.

12.14 CONSTITUENT MATERIALS OF CONCRETE

12.14.1 The Contractor shall allow in his Contract Sum the provision of materials for tests and delivery to approved Empanelled and accredited laboratories. Testing fees shall also be borne by the Contractor.

12.15 FORMWORK

12.15.1 Notwithstanding the acceptance by the Engineer, the strength and adequacy of the formwork shall remain the responsibility of the Contractor and/or his PE.

12.16 OTHER ITEMS

12.16.1 The Contractor shall paint all exposed metal parts with two coats of primer, one undercoat and two finishing coats of synthetic enamel paint unless otherwise stated.

12.16.2 The Contractor shall allow for all other items referred to in the Specifications and Drawings but not specifically covered under items mentioned above and items not specifically mentioned in the documents but otherwise necessary for the completion of the Works.

For detailed specification KBS/KRBS/ MoRT&H can be referred.

13. AS BUILT DRAWINGS

13.1 The Contractor shall within three (3) months after the completion of the Works provide the following documentation:

a) As-constructed Site Plan / As-built Topographical Survey, inclusive of retained topographic features within the contract boundary (1:500 scale);

b) As-constructed Longitudinal Section Plan (1:1000 scale for horizontal alignment and 1:100 for vertical alignment);

c) Setting Out Plan (1:1000 scale);

d) As-constructed Traffic Plan (1:1000 scale);

e) As-constructed Civil and Structural Plans of all structures, these shall be submitted progressively upon completion of the structures;

f) As-constructed drains submission.

13.2 The As-constructed Drawings shall be prepared in accordance with the Employer's Drawing and CAD Standards (ACAD) to be issued to the Contractor upon award of the Contract.

13.3 The above plans shall be prepared in either Two-Dimensional or Three-Dimensional (3D) CAD format (DWG File). The As-constructed Site Plan and Setting Out Plan shall be endorsed by a Registered Surveyor and other plans endorsed by a PE.

13.4 All drawings shall be submitted to the Engineer within three (3) months after completion of Works in the following format:

a) Master Transparency;

b) Two (2) sets of paper prints in A1/A0 size and 2 sets of paper prints reduced to A3 size. All the A3 size drawings should be properly ring binded with plastic sheet cover;

c) One set of the softcopy in Compact Disc (CD)/ pendrive.